

A NEW SPECIES OF *SAXIFRAGA* (SAXIFRAGACEAE)
FROM THE OLYMPIC MOUNTAINS, WASHINGTON, AND
VANCOUVER ISLAND, BRITISH COLUMBIA

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ABSTRACT

Saxifraga tischii, a new species from the Olympic Mountains of Washington, and Vancouver Island, British Columbia, is described and illustrated. Distinctive features include its dwarf size, persistent chlorophyllous petals, and leaves with relatively aporous spongy mesophyll.

Recent surveys of Olympic Peninsula flora (Buckingham and Tisch 1979, 1983) have revealed the existence of a new species, herein described.

Saxifraga tischii Skelly, sp. nov.

Herba rosulata, perennis. Rhizoma breve. Laminae 5.5–17(–22) mm longae, 3.5–10(–17) mm latae, ovatae, ellipticae vel orbiculatae, supra glabratae, infra fusco-tomentosae, apicibus acutis vel obtusis, basibus cuneatis vel acutis, marginibus crenato-serratis; petioli (3–)4–10(–20) mm longi, marginibus pilosis. Caulis florifer (2–)3.5–7.5 cm altus, purpureus, glandulosus pubescentibus. Flores (3–)5–10(–18); calyx 2–4 mm longus, rotatus vel campanulatus, purpureus, dentibus ovatis vel lanceolatis (0.7–)1–2(–2.5) mm longis; petales 5–6, lanceolati vel spatulati, 1.2–2.2(–2.6) mm longi, 0.3–0.8(–1.2) mm lati, virentes vel purpurei, parce ciliati; filamenta 0.6–1.9(–2.3) mm longa; antherae roseae; styli divaricati; pedicelli 2–6 mm longi cum 0–2 bracteolis lanceolatis. Fructus purpureus, glaber, 2.3–3.5 mm longus (Fig. 1).

Rosulate perennial herb arising from short rhizome. Leaf blades 5.5–17(–22) mm long, 3.5–10(–17) mm wide, ovate, elliptical, round or rhomboidal, glabrous (rarely puberulent) above, brownish-tomentose and anthocyanic beneath, with acute to obtuse apex, cuneate to acute (rarely obtuse) base, and crenate-serrate margins, teeth 7–17; petioles (3–)4–10(–20) mm long, 1.5–3(–5) mm wide, with pilose margins. Flowering stem (2–)3.5–7.5 cm tall (in fruiting condition to 12.5 cm), purplish, glandular-pubescent, scapiform, bracteate; primary bracts lanceolate, 3–5.5(–7) mm long. Flowers (3–)5–10(–18) in small cymes; calyx 2–4 mm long, rotate to campanulate, purplish, puberulent, lobes 3-nerved, ovate to lanceolate, (0.7–)1–

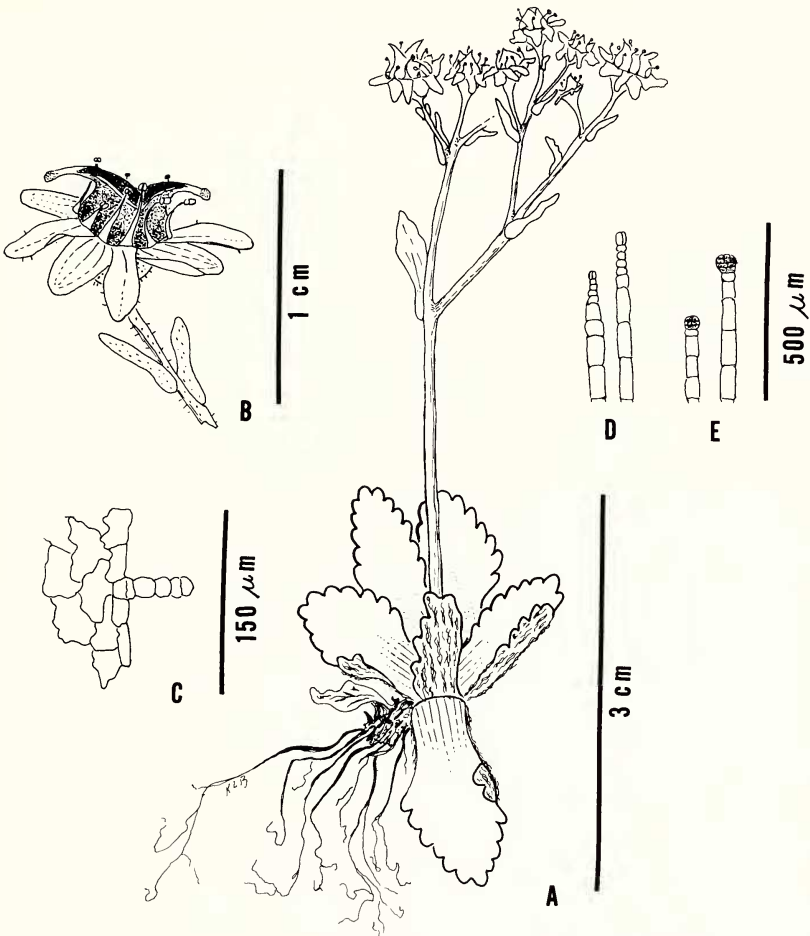


FIG. 1. *Saxifraga tischii*. A. Habit. B. Flower and pedicel. C. Cellular details of petal margin and trichome. D. Trichomes from pedicels. E. Comparable trichomes from *S. aequidentata*.

2(-2.5) mm long, with acute to rounded apices; petals 5-6, lanceolate to spatulate or oblanceolate, clawless, persistent, 1.2-2(-2.6) mm long, 0.3-0.8(-1.2) mm wide, greenish to purple, often with 1-7 cilia-like trichomes; stamens 10-12, filaments 0.6-1.9(-2.3) mm long, usually white (rarely purplish), widest at base; anthers pinkish to orange, ca. 0.3-0.5 mm wide; styles divaricate, ca. 1 mm long; pedicels 2-6 mm long with 0-2 bracteoles 1.5-3.5 mm long. Fruit purplish, glabrous, 2.3-3.5 mm long. Seeds tawny-colored, fusiform, ca. 0.6 mm long.

TYPE: USA, WA, Clallam Co.: Mt. Baldy, Olympic Mountains, T28N R4W S22, 6300 ft (1920 m), 24 Jul 1976, *Tisch 2307* (Holotype: UC).

PARATYPES: WA, Jefferson Co.: Buckhorn Mt., Olympic Mts., T27N R4W S13, 6800 ft (2070 m), 3 Aug 1984, *Tisch 2817* (WTU) and *Tisch 2818* (WS); Goat Lake area, Olympic Mts., T27N R4W S9, 6300 ft (1920 m), 18 Aug 1984, *Tisch 2897* (OSC); "Petunia Peak", Olympic Mts., T27N R4W S9, 6500 ft (1980 m), 18 Aug 1984, *Tisch 2905* (ORE); Mt. Olympus, Olympic Mts., T27N R8W S33, "8150 ft." (probably ca. 7900 ft), 13 Aug 1907, *Flett 3015* (WTU); Clallam Co.: Mt. Angeles, Olympic Mts., T29N R6W, 5 Sept 1909, *Webster 1879* (WTU); Mt. Angeles, 5500 ft (1676 m), 2 Aug 1930, *Thompson 5556* (WTU); Hurricane Ridge, Olympic Mts., 4500 ft (1372 m), 9 Jun 1934, *Thompson 10589A* (WTU). Canada, British Columbia, Vancouver Island, Castlecrag Mt., Strathcona Park, 1500 m, 9 Aug 1979, *Ogilvie and Beguin 798911* (V).

Distribution, habitat and phenology. *Saxifraga tischii* grows on ledges and in rock crevices at subalpine and alpine levels, ca. 1372–2400 m, in the Olympic Mountains, Clallam and Jefferson cos., Washington, and the interior of Vancouver Island, British Columbia. Substrates include basalt, breccia, limestone and sandstone. The plants occupy shallow (ca. 1–3 cm), well-drained soil pockets on north to northeasterly aspects, often in cirques near persistent snow patches. They flower from June to August. The chlorophyllous petals may reflect extended adaptation to the short growing seasons of these shady, microthermal environments.

Associated species include: *Anemone drummondii* Wats. var. *drummondii*, *Carex nardina* Fries, *Cystopteris fragilis* (L.) Bernh., *Douglasia laevigata* A. Gray var. *ciliolata* Const., *Draba lonchocarpa* Rydb. var. *lonchocarpa*, *Luetkea pectinata* (Pursh) Kuntze, *Luzula spicata* (L.) DC., *Poa paucispicula* Scribn. & Merr., *Ranunculus eschscholtzii* Schlecht. var. *eschscholtzii*, *Romanzoffia sitchensis* Bong., *Saxifraga caespitosa* L. var. *emarginata* (Small) Rosend., *Senecio flettii* Wieg., *Veronica cusickii* A. Gray, and *Viola flettii* Piper.

Relationships. *Saxifraga tischii* does not key well to known taxa in floras covering the Olympic Peninsula (Jones 1936, Hitchcock and Cronquist 1974), nor is it found in treatments for adjacent regions to the north (Hulten 1968, Scoggan 1978–79) and east (Davis 1952). Hitchcock (*in* Hitchcock and Cronquist 1961) discusses apetalous and purple-petaled *Saxifraga* from Mt. Olympus and vicinity, referring them to *S. occidentalis* Wats. var. *rufidula* (Small) Hitchc. Perkins (1978), who monographed the *S. occidentalis* species complex, accepted Hitchcock's interpretation and merely reassigned

the specimens to *S. aequidentata* (Small) Rosend., a synonym of the former taxon. I examined these early collections, listed here as paratypes, and found them to match the *S. tischii* holotype in all pertinent features.

The type specimens of *S. tischii*, without exception, possess tiny chlorophyllous petals with anthocyanic colorings on their margins and apices. The petals do not wither following anthesis, but remain alive and, apparently, photosynthetic through advanced fruiting. They form no visible abscission layer. Petals of *S. tischii*, in contrast with those of *S. aequidentata*, have a mesophyll-like core, stomata, and often bear multicellular trichomes (ca. 1–7) along their margins (Fig. 1). Although plants of *S. tischii* are generally smaller than those of *S. aequidentata*, developmental differences and environmental extremes produce some quantitative overlap. There are significant differences ($p < 0.001$) in petal width, filament length, number of leaf dentations, and petiole length/width ratio (Table 1). The measurements of *S. aequidentata* are largely from specimens at WTU that were annotated by Perkins and represent the range of that species.

Similarities in pistil structure, scape branching, and the general shape and dentation of basal leaves suggest that *S. tischii* and *S. aequidentata* share common ancestry within the *S. occidentalis* species complex. *Saxifraga tischii* may have evolved during the Pleistocene in mountain refugia of coastal British Columbia and/or in the Olympic Peninsula. The current restriction of *S. tischii* to cool, shady rock crevices at high elevations suggests it has limited ecological amplitude and is a highly specialized, narrowly restricted species. In the Olympics and elsewhere, *S. aequidentata* has wider distribution and occupies a variety of moderately sunny to shady environments from near sea level (e.g., near Portland, Oregon) to above 2000 m. Perkins (1978) stated that it prefers thin-soiled rock outcrops “in vernal moist, often dripping seeps”. Such environments in the Olympics (e.g., cliffs at Lake Crescent cited by Perkins 1978) usually dry out by late June, leaving the plants in a shriveled condition. *Saxifraga tischii* is semi-evergreen and carries some leaves through two growing seasons. In its normal habitats it does not shrivel after anthesis. Moreover, it grows poorly when transplanted to lower elevations. Ten cold-frame plants of *S. tischii*, kept at 650 m near Port Angeles, Washington, produced only one 2-cm (5-flowered) scape in two growing seasons. Three *S. aequidentata*, similarly located, produced eight scapes with up to 40 flowers. Under cultivation *S. tischii* retained its dwarf stature and produced typical flowers with green petals, short filaments, etc., indicating that these traits are genetically fixed. Scapes of *S. aequidentata* grew to over 12 cm and produced their normal white flowers.

Floral structure is usually more conservative and less subject to

TABLE 1. SOME MORPHOLOGICAL AND ANATOMICAL DISTINCTIONS BETWEEN *S. tischii* SKELLY AND *S. acquidentata* (SMALL) ROSEND. *From Perkins (1978).

Character	<i>S. tischii</i>	<i>S. acquidentata</i>
Petals		
Color	Green to purplish	White
Chlorenchyma	Present	Absent
Longevity	Persistent and alive through fruiting	Short-lived and mostly deciduous in fruit*
Stomata	Present	Absent
Marginal trichomes	Often 1-7/petal	Absent
Shape	Lanceolate, spatulate, oblong, oblanceolate	Ovate, oval, elliptic
Apex	Acute to rounded	Often emarginate
Base	Clawless	Often clawed
Surface (at 100×)	Non-papillose	Strongly papillose
Venation	1-nerved	Midrib usually with 2-4 lateral veins
Width	0.3-0.8(-1.2) mm, \bar{X} = 0.6 mm (n = 100)	1.3-2.2(-2.8) mm, \bar{X} = 1.7 mm (n = 100)
Stamens		
Filament length	0.6-1.9(-2.3) mm, \bar{X} = 1.3 mm (n = 180)	1.5-3.5 mm, \bar{X} = 2.7 mm (n = 180)
Filament shape	Subulate, basally flared	Often slightly clavate
Basal leaves		
Teeth on developed leaves	7-17, \bar{X} = 10 (n = 80)	13-29, \bar{X} = 19 (n = 80)
Petiole length/width ratio	1.1-5.6, \bar{X} = 3.0 (n = 70)	2.4-16.7, \bar{X} = 8.7 (n = 70)
Spongy mesophyll	ca. 120-200 μ m thick, relatively aporous	ca. 150-400 μ m thick, aerenchymatous
Flowering stems		
No. flowers/scape	(3-5)-10(-18)	To 74*
Trichomes of pedicels	Stalk cells often >6, gland 1- to 2-tiered	Stalk cells usually <6, gland often 3-tiered

evolutionary change than vegetative structure (Benson 1957, Jones and Luchsinger 1986). The minimum of 12 floral differences that separate these two species (Table 1) indicate much greater evolutionary distance than their superficial vegetative similarities may have suggested to earlier investigators.

This species is named after E. L. Tisch, my biology instructor and advisor at Peninsula College, Port Angeles, Washington.

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